



Subject card

Subject name and code	Photophysics of biological systems, PG_00053322						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Dampc					
	Teachers	dr inż. Marcin Dampc					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		5.0		40.0	75
Subject objectives	The interactions between electromagnetic radiation and biological systems will be presented and discussed. Biological systems will be represented by wide range of systems from isolated biomolecules to macroscopic systems. Phenomena of radiation absorption and emission will serve as a foundation for further discussion of photochemistry in biosystems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	Is capable of selecting appropriate experimental method for investigated phenomenon and determine the properties of biological systems.			[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Advanced knowledge on atomic and molecular excitations enable student to understand processes behind the spectroscopic data from experiment.			[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
Subject contents	Radiation interactions with matter. Electronic, vibrational, rotational excitation. Photoionization. Fragmentation. Jabłoński's diagram. Radiation emission. Photochemistry. Multiphoton processes. Femtosecond photophysics. Free radicals. Photosynthesis. Radiation damage to DNA. Bioluminescence. Clinical phototherapies.						
Prerequisites and co-requisites	Introduction to spectroscopy.						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Seminar		50.0%		50.0%		
	Written assessment		50.0%		50.0%		

Recommended reading	Basic literature	1. Z. Kęcki "Introduction to molecular spectroscopy" PWN 1975 2. P. Suppan Chemistry and light, PWN 1997
	Supplementary literature	1. B. Mielewska "Biophysics" Wydawnictwo PG, 2015
	eResources addresses	Adresy na platformie eNauczanie: Fotofizyka układów biologicznych (2024) - Moodle ID: 22485 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22485
Example issues/ example questions/ tasks being completed	1. Selection rules for optical transitions. 2. Present and discuss one example of bioluminescence 3. Present and discuss one example of photoisomerisation process with practical application in medicine.	
Work placement	Not applicable	